SCIENCE

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THE NEW OPPORTUNITY FOR SECONDARY SCHOOLS.

PROFESSOR G. G. RAMSEY, of the University of Glasgow, said last November in an address on 'Efficiency in Education,' while speaking of the need of new definitions and new standards in education:

"It is not merely that new subjects have been introduced for which a place must be found; but also that the demand for higher education of some sort, and of the best sort available, is being made on behalf of a much wider and larger class than formerly. It is no longer a select class, consisting of those destined for professions and the higher walks of life, whose needs demand attention; the nation has at last been roused to the necessity, which many of us have been preaching all our lives as a matter of national concern, of training to the utmost the brain power of the community, and of bringing within the reach of every capable mind, in every class, the benefits of a liberal education. There is," he adds, "at this moment a boom on amongst us in this matter of higher education; and it is of the greatest consequence to the country that this boom should expend its force in the most promising directions."

In the course of his address, this eminent 'professor of humanity' frankly admits that, 'the highest literary and classical edu-

cation appeals to only one side of human culture.'

There is nothing very new in this last remark, for we have all said the same thing in some form, but it is new to have such a man say it so plainly. It reminds one of an earlier plea for a broader system of training by Dean Farrar, in which he said, after thirteen years' experience as Master of Harrow: "I must avow my distinct conviction that our present system of exclusively classical education, as a whole, and carried on as we do carry it on, is a deplorable failure. I say it knowing the words are strong words, but not without having considered them well. It is no epigram, but a simple fact, to say that classical education neglects all the powers of some minds, and some of the powers of all minds."

But it is not my purpose to attack nor my wish to undervalue classical culture. There is not a single well-arranged course of literary study which I wish to overthrow. What I ask is the establishment of additional courses, which are as truly liberal and, for the great majority of youth, much more efficient and timely. I have quoted two eminent, open-minded authorities to the end that all of us may be open-minded in the consideration of the great educational problems of to-day.

The opportunity and duty for secondary schools rest upon two conditions which must be briefly stated: First, secondary education is becoming more general; in the next place, the demand is imperative that the curriculum of the secondary school become* broader. Let us examine these conditions.

1. There is an increasing tendency to require school attendance up to a certain age or to the completion of a certain standard of scholarship. Recent legislation is in the direction of more schooling and higher education, and even where legislation is wanting, public opinion is strongly in that direction; this is conspicuous where manual training has been incorporated into the secondary program.

In England and Germany elementary education is compulsory and, therefore, universal up to what we call the high school. The same is true in many states in this country. A few years ago there was serious opposition to high schools supported by taxation, and the great mass of children had no expectation of entering a secondary school. At the present time that opposition has vanished, and in many communities it is the rule and not the exception for a graduate of the highest grammar grade to enter the high school.

The rapid growth of the secondary school can not escape observation. The increased range and efficiency of the grammar schools is partly the cause and partly the consequence of increased privileges in the way of high schools. This is strikingly shown in many cities, notably in the two chief cities of Missouri, St. Louis and Kansas City. In St. Louis the board of education is building two fine manual training high schools, which will be opened for students next year. These schools have long been necessary, but an unfortunate provision in the state constitution kept the school tax at so low a rate that the secondary features were greatly neglected. Nearly a year ago the constitution was amended, raising the limit of taxation for schools from four mills to six mills per dollar of assessed value, or a dollar and a half of actual value. To a surprising degree the prospect of new schools has strengthened the higher grammar grades. The feeling that the high schools belong to all children is taking deep

* I do not accept the fanciful distinction President Hadley makes between secondary education and the curriculum of the secondary school. To me they mean the same.

root, and I predict that the high school attendance in St. Louis will double within two years.

This result has actually been achieved in Kansas City. Its high school attendance has in seven years increased *one hundred* per cent., while its population has increased *fifty* per cent. This is largely explained by the organization and equipment of what appears to me to be the largest and most successful manual training high school in the world. The enrollment at the manual high school has been as follows from the start, beginning with 1897: 843, 1,114, 1,244, 1,492, 1,677, 1,706 in 1903.

But not the west alone. The high school attendance has increased 48 per cent. in Springfield, Mass., while the population has increased 19 per cent. In Worcester, Mass., the high school attendance increased 124 per cent., while the population increased 36 per cent. Boston and Philadelphia show similar gains; in short, there is hardly a prosperous community where a similar growth is not observed.

It would be unreasonable to attribute this growth to any one thing, as for instance the introduction of manual training. Beyond question that has had much to do with it, but increased wealth, improved social conditions and a growing conviction that education is a good business investment, have had much to do with bringing about this gratifying result. Twenty years hence secondary school diplomas will be relatively as numerous as elementary school diplomas were twenty years ago.

2. We must be getting our houses in order to receive, educate and train the coming army of boys and girls. They will want the best, and their wishes will be law. The demand for broader curriculum for the secondary school is imperative. The classical academy and the classical high school will continue to exist and do valuable work. No one who knows the value of high grade classical training wishes to do away with such schools or to lower their moral and intellectual tone, but we must not shut our eyes to the fact that they do not cover the whole field of secondary education, nor do they meet the wishes and needs of the great majority of fourteen to fifteen and sixteen-year-old boys and girls. It is not a question of brains, nor of morals, nor of health; it is a question of environment, of taste, of ambition, of outlook. The men and women who are to do the world's work need and wish to be trained to do it well. They must not only be strong, but they must be versatile, skillful and wise. Solomon prayed for a 'wise and understanding heart.' In a measure that is what every healthy boy and girl prays for. I would put emphasis on the word 'understanding.' Everything in education should conduce to understanding, just as everything which conduces to understanding is education. I have no use for studies which yield culture without understanding—in fact I deny that there is valuable culture without understanding. I have no patience with people who know that a study is useful only in proportion as it is understood, and yet claim that its culture value is inversely as its utility in practical life. Whether we teach Latin, geometry, physics, the theory of a tool or a process of construction, let us give our pupils understanding. The pupil who has formed the habit of understanding what he sees or reads or handles will carry into the world the habit of studying life's problems with eyes, hands and brain, till he understands them.

There is really no necessity for a plea for new courses of study in the secondary school. We are substantially agreed on that point. Not one half of the boys and girls of Boston ever get inside of a high school. Why is it? The high schools are

supported by taxation and they are as free as the grammar school to all. It is not because the people are poor—that excuse would cover but a small per cent. of the absentees. It is not because they have not ample brains and average common sense. A small percentage are undoubtedly stupid, but some of the stupid, as we all know, find their way into the high schools and colleges. These two reasons, poverty and stupidity, are the reasons generally given, but the great bulk of the absence from secondary schools has still to be explained.

In my judgment the best word to explain the non-appearance of over fifty per cent. of boys and girls in our secondary schools is 'incompatibility.' There is a lack of harmony. The school does not give what the pupils want.

Now do not jump to the conclusion that because the boy does not want what the school has to give he is altogether unreasonable and low-minded. He wants, as Emerson says, 'an education to things.' He sees the world at work around him and he knows that he must work, and he wants an education that will enable him to work intelligently, efficiently and to his advantage. If he is conscious of capacity, the school must convert it into faculty. The school must help and not hinder him. He cares not for authority, has no respect for traditions, and ancient history does not interest him. He wants the latest news; he respects what is in force to-day; he must see with his own eyes; he himself must unlock the doors, and with his own hands unbar the gates of the future. He believes that Robert Ingersoll told the truth when he said that, "Much that is called education simply unfits men successfully to fight the battle of life. Thousands are to-day studying things that will be of exceeding little importance to them or others. Much valuable time is wasted in studying languages that long ago were dead, and histories in which there is no truth."

And when those boys who *must* make their own living and build their own homes, and those who *wish* to make their own way in the affairs of the world, turn away from continuous literary studies, even the literary world approves their choice. It would be the height of folly to go into the streets, the shops, the factories, the stores, the offices, the fields, the gardens, the stables and the general loafing places—to go into all the places where fifty or sixty per cent. of the boys from fourteen to seventeen years are found, and, if we could, bring them all into school and teach them Latin, Greek and mathematics, as I was taught till I was eighteen years old, as though we expected them all to go on to college, and become literary or professional men.

Said President Wilson, of Princeton, in his inaugural address: "The college is not for the majority who carry forward the common labor of the world, nor even for those who work at the skilled handicrafts which multiply the conveniences and the luxuries of the complex modern life. The college is for the minority."

The average secondary school, if it prepares pupils for anything, prepares them for college; and since the college is not for the majority, the secondary school is not for the majority. What then is there for the majority? If they are to have secondary education at all it must be something different.

The curriculum must be broadened. It must touch modern life, modern conditions, modern forces, modern responsibilities. As Huxley expressed it: 'It is folly to continue, in this age full of modern artillery, to train our boys to do battle in it equipped only with the sword and shield of the ancient gladiator.' Sir Lyon Playfair changed the figure in protesting against

the English system of secondary education, as follows: "In a scientific age and in an industrial section, an exclusive education in the dead languages is a curious anomaly. The flowers of literature should indeed be cultivated, but it is not wise to send men into our fields of industry to reap the harvest, when they have been taught to pick the poppies and push aside the wheat."

When the wide-awake, inquisitive boy knows that electricity, and steam and heat, and the art of designing and constructing automatic machines can be studied and understood with no more effort and in less time than it takes to commit to memory a Latin grammar, or to read Demosthenes without a dictionary, and that those former things are ten times as interesting as the latter, and a hundred times as likely to be of service to him in the struggle for life and the battle for success, he will choose them if he has a chance. And it is our business to give him a chance. To quote Emerson again: 'We must take the step from knowing to doing.' I read the other day that in Indianapolis, Ind., where they have two fine high schools, one of the older and one of the newer type, 580 pupils from the grammar grades applied for admission to the high schools. Four hundred of them, or 69 per cent., applied for the manual training high school. This indicates not so much a change of sentiment in regard to the values of the classical school as the creation of a new high school constituency.

We want living languages and living issues. We must teach the duties of an American citizen rather than the manner of life of a slave-owner in Athens or Babylon. We must teach the mechanics, hydraulics, electricity and chemistry of to-day rather than the physical theories of Aristotle and the alchemists. We must illustrate and explain the battle of Santiago rather than the battle of Salamis. It is a thousand times more interesting and more useful to the average boy to know how modern engineers tunneled under the Alps than to read the fabulous stories of how Hannibal made a road over them; to know how Eads built a railway bridge across the Mississippi, than to decipher Cæsar's footbridge over the Rhine; to analyze and comprehend the water-works of Boston or London, than the hydraulic system of ancient Rome, marvelous as it was; to master the universal language of drawing, than to get a smattering of a language which no one speaks and no one writes; to become familiar with modern methods of construction and the skillful use of tools and machinery, than to speculate over the Tower of Babel or the Pyramids of Egypt.

Here is the magnificent opportunity for the secondary school; to use a military phrase, let it change front and face the world of to-day. Let it open all its doors and windows to the humanities of to-day. Look around you and look forward, not always backward. Weep not, as Ruskin did for departed days, for the lumbering stage-coach, the storm-driven wooden ships, the hand loom, the log hut, and the good old days of blissful feudalism. I am amazed when I think how much we are spellbound by tradition. Perhaps I have been as footloose as any of you, yet I find myself continually approving of educational features for no good reason except that they are fashionable. We somehow seem to think it means far more and is in far better form to know that the nymphs gave Perseus a helmet which Vulcan made for Pluto, and which rendered him invisible, than to know that Thomas A. Edison invented the incandescent lamp and made it possible for Niagara Falls to light a hundred thousand of them, twenty-five miles away; and yet we don't believe one word of the former

story, while we accept every word of the latter.

It is of course a matter of association. Sir Leicester Deadlock, in Bleak House, could not endure a man who experimented with a steam engine and who seemed quite at home with a coal-burning furnace. He drew inferences as you and I do. Sir Leicester inferred that the man who understood engines and power houses must be ignorant of polite learning and unfamiliar with the ways of good society. So you jump to the conclusion that the man who knows all about Edison and the generation of electricity is probably ignorant of Greek mythology and not proficient in spelling.

Well perhaps you are right and perhaps you are wrong. But this is certain: It is no longer safe to assume that your engineer or your electrician is an uneducated man, or that he lacks culture. There is more than one kind of culture. Emerson speaks of 'having a mechanical craft for culture.' By culture I mean a knowledge of some of the best things that have been done and said in the world; a certain refined and gracious spirit; a soul of honor; a depth of human sympathy; a wise and understanding heart; an all-pervading love for what is useful and true, and therefore good and beautiful. That kind of culture can be gained with or without much ancient literature; with or without much mathematics; with or without the physical, biological or dynamic laboratory; with or without the art room or the drafting room; with or without the theory of typical tools and correct methods of construction. There is no necessary divorce between the skilled hand and the cultured mind; both are needed for the highest culture.

I am not pleading to-day for the minority who are already in our secondary and higher schools. I am not asking that you deny the 'classics' to those who ask for them. Get the classic arts and the mechanics too if possible; but I am pleading for that vast majority who are not in secondary schools but who are coming, many of whom will inevitably go on to our colleges and technical schools. I beseech you, set up no narrow aims, no insufficient motives in managing these schools. Then let us broaden the spirit and scope of the colleges and universities. Nine out of ten of them assume that the college curriculum is for students aiming at five professions or occupations, including teachers and 'people of leisure.' The last are those who inherit wealth, and are, therefore, not under the necessity of earning their own living. When Hawthorne got through college he carefully scrutinized the occupations which seemed to be open to him. He reported his conclusions as follows in a letter to his mother: 'I can not become a physician and live by men's diseases; I can not be a lawyer and live by their quarrels; I can not be a clergyman and live by their sins. I suppose there is nothing for me to do but write books.'

Now the majority who are coming will inherit no wealth; they expect and desire to earn their own living. We do not need them as lawyers, or ministers, or doctors; we hope they won't all write books; we do need them as teachers, as engineers, as accomplished workmen in our industries and in our unhistorical methods of trade and commerce. Let us persuade them that education and skill dignify and adorn every occupation, every calling; that the legitimate fruit of a combination of literary and scientific culture and technical skill in dealing with materials and forces will be a generation of stronger, abler and more successful men in industrial, commercial and political life.

Let us begin, if you please, by training

a part of this majority to become superior craftsmen, rather than to feel that they are superior to all crafts, and to be unwilling to be put to any.

Let us avoid the serious mistake of educating the majority as though they were a privileged minority. Let us accept once and for all the doctrine that any occupation may be ennobled, enriched and dignified by education, training, and skill; that there are a score of new professions requiring a high order of intellect, and the close and continued study of subjects as difficult and as profound as are the branches which lead up to the so-called learned professions.

The educated and highly accomplished architect or engineer is a learned man, and he stands second to none in the forum and in the arena of activity to-day. There is a great and an increasing demand for such men in every city in the land. I have been training engineers for nearly half a century, and I know how inadequate the supply is. In St. Louis we are quite unable to furnish graduates of our manual training school as fast as they are wanted in all kinds of industrial work. The other day I was told that there were twelve hundred educated engineers in Pittsburg, and the demand was continually for more. The number of students in the technical schools —that is, the schools for applied science in the various branches of engineering and architecture—ought to be as numerous as in colleges for letters and pure science, and they will be as numerous when the secondary schools recognize the majority as they now do the minority. The number of students in colleges and higher technical schools is increasing in this country at the rate of five per cent. every year.

What has been done in Philadelphia, Kansas City and in some other cities, and what is now doing in St. Louis, ought to be done in every city that can maintain a high school, viz., offer facilities for a secondary education looking towards industrial occupations and technical professions equal, at least, to those offered for students looking forward to clerical or mercantile occupations and the traditional professions.

Are you doubtful about the intellectual, moral and social standing of the graduates of schools which incorporate a thorough course of manual training, including practical drafting with a modest academic course? If so, it will be of value if I give you the record of the graduates of a high grade manual training school which has been in existence twenty-three years and has graduated twenty classes. I refer to the school connected with Washington University in St. Louis.

Before I read the list please bear in mind that the school does not aim to produce mechanics. Not every boy is fit to be, or has the ability to be, a good mechanic. When the whole boy has been put to school three or four years he finds out what his strong points are, if he has any, and he works into the occupation where he is most likely to achieve success. In point of fact the round plug gets into the round hole, and the square plug gets into the square hole, with an infinite sense of compatibility pervading both plugs and holes. Many graduates who started life as mechanics have pushed along, and have been called up higher, to greater responsibilities and to larger rewards. We do not pretend to know what a boy is by nature best fitted for, nor what opportunities his environment will offer. We attach no value to the whims and fancies of a thirteen-year-old boy, and very little to the ambitious hopes of parents. When a boy stands four-square on a broad foundation he is pretty sure to build aright.

OCCUPATIONS OF THE GRADUATES OF THE MANUAL TRAINING SCHOOL OF WASHINGTON UNIVERSITY, ST. LOUIS.

Agriculture and stock raising	14
Architects	24
Artists	4
Banking	7
Bookkeepers, general assistants and clerks	153
Cashiers	5
Chemists	9
Contractors	2
Dentists	4
Draftsmen	100
Electricians	19
Fieldmen	4
Foremen	3
General managers	32
Insurance	9
Lawyers	30
Library	1
Mechanics	12
Merchants and manufacturers	90
Ministers	1
Physicians	22
Real estate	18
Reporters	2
Salesmen and agents	41
Students	59
Superintendents of manufactories	44
Teachers	39
Technical engineers	63
U. S. Navy engineers	4
Miscellaneous	12
Unknown	56
Number who have taken degrees elsewhere after leaving the Manual Training School	159

This outcome suggests an important function of a secondary school which I have not seen clearly stated. The secondary school should enable a boy to discover the world and to find himself.* I use the word 'discover' in the sense of *uncover*, that is, *lay bare* the problems, the demands, the openings, the possibilities of the external world. A boy finds himself when his internal world is laid bare to a conscious examination and inventory.

* "The successful school must achieve two positive results: on the one hand it must reveal the world to the pupil; on the other it must reveal the pupil to himself."—Walter J. Kenyon, in the *School Journal*, March, 1893.

If the secondary school shall do those two things well it will do what generally has never been done at all. This can not be done with a single curriculum, along any line. All your windows and doors must be open.

While I plead for the neglected majority and point out the glorious opportunity of the secondary school I must speak a word for the benefit of the minority to whom of course all of us belong.

The great mass of American teachers has as yet no adequate conception of the fine invigorating effect of a correct system of manual training upon the mind and character of a healthy, normal boy. I do not refer to manual training falsely so called; to the wishy-washy tinkering with tools and materials where the child is the victim of his own whims, and of his teacher's ignorance; where under the pretense of developing originality, altruism or concrete expression, the child is prematurely misled, misdirected and mistreated, until the possibility of well-timed and well-regulated manual training is utterly lost. I regret that I must speak so strongly of a tendency utterly to emasculate manual training by a method of treatment which would be instantly condemned if applied to any other branch of study. We must, I suppose, excuse a great deal of sentimentalism and extravagance on the ground that the most recent converts are apt to be unbalanced by excess of zeal.

Manual training furnishes many of the elements of culture and discipline which are lacking in the ordinary secondary course of study. Contact with the concrete; clear concepts of materials, forces and instrumentalities; exact knowledge of mechanical processes; analyses of complex operations; the idea of precision; habits of system, of foresight and of intellectual honesty. These mental, moral and phys-

ical elements are invaluable. It is not strange that President Eliot said: "Manual training not only trains the eye and hand, but develops the habit of accuracy and thoroughness in any kind of work. It develops the mental faculties of some boys better than books do." Professor James, of Harvard, says that "The most colossal improvement which recent years have seen in secondary education lies in the introduction of manual training." And Dr. Stanley Hall says: "No kind of education so demonstrably develops brain as hand training."

The minority should have the benefit of this improvement and of those benefits most assuredly. So here is another splendid opportunity for the secondary school.

To a graduate of Harvard who has for years labored assiduously in secondary and higher technical education to establish a system of instruction which looks squarely towards modern developments in science and the industrial arts, it is extremely gratifying to find his *alma mater*, under the leadership and inspiration of its distinguished president, taking high ground both in the organization of technical branches of instruction and in the vindication of their dignity and worth. One is led to apply to Harvard the language the London *Times* used in speaking of the establishment of engineering courses in the University of Cambridge, England: "It is pleasant to see our oldest university, while remaining faithful to all the traditions of its venerable past, at the same time displaying an intelligent appreciation of the wants of the future, and affording to the most modern forms of learning the nurture and support which, for many centuries, it has afforded to those forms with which alone our forefathers were familiar."

C. M. WOODWARD.

June 4, 1903.

TEN YEARS OF AMERICAN PSYCHOLOGY: 1892–1902.

II.

THE RELATION OF THE ASSOCIATION TO OTHER SCIENTIFIC ORGANIZATIONS.

Our association began its career as an academic affair. Fourteen universities and one lunatic asylum were represented among the original twenty-six members. Just one third of the institutions were in New England and shared just fifty per cent. of the membership. Since then every meeting has been held under the wings of a university. Until the fourth annual meeting, the psychologists were content to stand on their own feet scientifically, and not to yield to the social attractions afforded by joining the numerous groups of scientists which were meeting here and there over the country. In 1895 the psychologists met for the first time with the American Society of Naturalists and Affiliated Societies. The philosophical pressure upon our organization came to something of a focus at this time, and was yielded to a year later, which was marked by a sudden influx of metaphysical papers and the formation of a section for the presentation of them. Seven meetings have been held with the naturalists, with whom a joint discussion has been held four times on various themes, in which a psychologist has participated as our representative. Our association has been invited four times to turn aside from its individual or annual way, and unite its associated interests with other scientific organizations, such as the American Association for the Advancement of Science and the British Association for the Advancement of Science. Joint sessions have also been held with the American Physiological Association, the Western Philosophical Association, and two summer meetings in connection with Section H,

Anthropology, of the American Association for the Advancement of Science have been authorized. We are now in active research cooperation, through representatives on joint committees, with the American Association for the Advancement of Physical Education, for gathering statistics and measurements, and certain other societies for preserving speech records. We have our three committees on physical and mental tests, vocabulary and bibliography. Once the pride of the association has been quickened into solicitude for the type of representatives of American psychology given standing in the international congresses of psychology. And here we are, one with numerous societies, bulked together in Convocation Week.

In accepting the overtures of scientific sociability our association has doubtless aided greatly in bringing about a change in that state of the public mind which once regarded the psychologists as something *sui generis,* who could not mingle in the truly social precincts of science. During the decennium there has appeared a decided recognition of the psychologists, at least, accredited through the affable hand and voice of other departments of science. Whether this scientific friendship extends so far as to include the very genius of what our science has to teach respecting both nature and mind is a phase of our growth which may well be reserved for more mature consideration. One might well say that all other sciences should affiliate with psychology, the true mother of science, inasmuch as she alone probes the sensory foundations of all our knowledge of nature and her processes. The present needs of our science make necessary a great deal of missionary work to be done on our part, and in affiliating our corporate interests, let us become fully aware of the doubling of the responsibility to our association and its fundamental issues.

TEN YEARS OUTSIDE THE ASSOCIATION.

It would be presuming too much in the face of the most general and well-known facts to imply that the chief features of the last ten years of American psychology are to be found within the history of our association. Having reviewed this in detail, we must now turn to that larger area of activity which lies without the organization, where we may, possibly, get a truer perspective of what the years have brought forth among us.

The laboratory represents, beyond all question, the most interesting feature in the recent development, and the largest promise for the future of psychology. Herein both the method of research and the pedagogy of the subject find their true abode. At the time of the first annual meeting of the American Association there existed some fifteen laboratories in America, fully equipped for research or in possession of special facilities for demonstration. They possessed an equipment which has been valued at about thirty thousand dollars. The institutions maintaining these laboratories were the universities of Pennsylvania, Wisconsin, Indiana, Clark, Nebraska, Harvard, Columbia, Iowa, Cornell, Wellesley (college), Yale, Brown, Michigan, Catholic University of America and the McLean Asylum, which began laboratory measurements in 1889. In the next two years ten additional laboratories were opened when the aggregate valuation of the equipment approximated sixty thousand dollars, and the annual appropriations for maintenance amounted to ten per cent. of the cost of equipment.*

* According to Delabarre, 'Les laboratoires de psychologie en Amerique,' *L'Année psychologique,* 1894, pp. 209–255.

At the present time, according to a recent inquiry,* this varied experimental equipment is found in forty colleges and universities in the United States, besides a few private laboratories and those connected with a few pathological institutions. The list includes twenty-six educational institutions additional to those named above. Arranged in alphabetical order these are Amherst, Bryn Mawr, California, Chicago, Cincinnati, Colorado, Dennison, Illinois, Leland Stanford Jr., Minnesota, Missouri, Mt. Holyoke, New York, Northwestern, Oregon, Princeton, Randolph-Macon Woman's College, Smith, State College, Teachers College, Tufts Medical School, Ursinus, Vassar, Washington, Wells, Wesleyan (Conn.). Twenty-six of these institutions are private, and fourteen are public (state). This distribution is strongly suggestive of the query, whether scientific psychology is purely academic, or whether it is lacking in that practical aspect and value sufficient to secure legislative appropriation of public moneys for its equipment and maintenance. Here, at least, is a practical problem of policy for our association to consider. It is known that a number of educational departments in some colleges and some normal schools have facilities for teaching psychology, but the exact data are not available. According to my present information, twenty-five per cent. of the men who are operating these laboratories and giving instruction in psychology as experimental have been trained in the Leipzig Institute. Scarcely any three of our American institutions can equal this representation and influence in this particular direction. We should not fail properly to interpret this interesting item of training in our American psychology.

* Made by Dr. E. B. Huey, who has kindly supplied me with the following data.

This is not the time, nor is there space, to go into the minuter details of the work that has been done in these institutions during the ten years. That there have been persistent efforts made in these workshops of inquiry is well attested by the growing list of experimental studies appearing in the two American periodicals and the number of rather private publications. During the decennium *The American Journal of Psychology* and *The Psychological Review* (founded in 1894) have published over eleven thousand pages of research, critical and review literature, almost equally divided between them. The latter has issued seventeen monographic studies in psychology in its special series of Monograph Supplements, begun in 1895. Lesser foundations for psychological publications are the *Studies from the Yale Psychological Laboratory,* begun in 1893, the *University of Iowa Studies in Psychology,* begun in 1897. Numerous articles on psychology have appeared in *The Monist* (founded 1890), the *Open Court* (founded 1887), and the *Philosophical Review* (established in 1892) has devoted a large portion of its pages to specific discussions in our science. Several universities, such as Chicago, Columbia and Cornell, have university serial publications, generally entitled contributions to philosophy, psychology and education, in which psychological studies frequently find place. While other institutions have bulletins, such as Missouri and Wisconsin, in which more rarely appear investigations of psychological topics, *The University of Toronto Studies* has a Psychological Series of four issues. Very recently there have appeared additions to these more special modes of publication, such as Witmer's *Experimental Studies in Psychology and Pedagogy,* and *Investigations of the Department of Psychology and Education of the University of Colorado.*

The educational applications of the subject have found their chief outlet in *The Educational Review* (founded in 1891) and *The Pedagogical Seminary* (founded in 1891), in which numerous special and general articles have appeared from time to time. For the present survey I deem it hardly necessary to detail the avenues of publication of psychological material to be found in the medical, physiological and biological periodicals. The work done in abnormal psychology is also omitted in this review.

In lieu of having prepared a definite statistical statement of fact respecting the scope of the mass of literature thus variously appearing and which is steadily growing, and thereby being able to specify the exact items in psychology which have been the successive objects of a possibly shifting interest, I offer a sketch of these considerations made by naming the first and the last original articles appearing in each volume of the two technical periodicals published in this country. This method of marking off the years has the added benefit of the counter-checking due to the multiple editorial selection of the important and the less important material available, which is apt to maintain a fairly reliable average of values. The titles are given in the following order: The first and the last titles of a volume of the *American Journal of Psychology,* with its years, are first stated; then the respective titles of a volume of the *Psychological Review,* with its year—omitting in the latter instance the presidential addresses before our association when they chance to be the leading article, in which case the second article is taken.

'Disturbance of attention during simple mental processes,' 'National destruction and construction in France as seen in modern literature and in the Neo-Christian movement' (1892–1893), 'The case of John Bunyan,' 'An experimental study of memory' (1894), 'Syllabus of lectures on the psychology of pain and pleasure,' 'A laboratory course in physiological psychology: the visual perception of space' (1893–1895), 'H. von Helmholtz and the new psychology,' 'The perception of two points not the space-threshold' (1895), 'Experiments on Fechner's Paradoxen,' 'Attention experimental and critical' (1895–1896), 'Psychology and physiology,' 'Physical and mental measurements of the students of Columbia University' (1896), 'Attention and distraction,' 'The psychophysiology of the moral imperative' (1896–1897), 'Studies in the physiology and psychology of the telegraphic language,' 'After-sensations of touch' (1897), 'The psychology of tickling, laughing, and the comic,' 'On choice' (1897–1898), 'Some effects of size on judgments of weight,' 'A mirror pseudoscope and the limit of visible depth' (1898), 'The migratory impulse vs. love of home,' 'A study of anger' (1898–1899), 'The relations between certain organic processes and consciousness,' 'A plea for soul-substance' (1899), 'The memory image and its qualitative fidelity,' 'Pity' (1899–1900), 'Psychological atomism,' 'An illusion of length' (1900). 'Creeping and walking,' 'Fluctuation of the attention to musical tones' (1900–1901), 'The social individual,' 'Study of early memories' (1901), 'The relation of the fluctuations of judgments in the estimation of time intervals to vaso-motor waves,' 'Mental growth and decay' (1902), 'The world as mechanism,' 'Feeling and self-awareness' (1902).

Generalization upon these captions is impossible, and scarcely pertinent. These thirty-six themes show a variation in interest rather than a steady development from a lower, narrower to a higher, broader

sphere. They show that interest in fundamental processes continued steadily, while time has been found for the more rare and exceptional activities of mind. More than half of them are experimental in character, in the severest sense of that term. The specialized tendencies of our psychological thinking appear, unquestionably, in such a sketch of the work which has been made the common property of the science.

The foregoing account of our psychological activities is admittedly limited. The best statement of the ten years that could be made would comprise a digest of the revised content in method, results and criticism which the succeeding years have brought forth. Such annual revision has doubtless taken place more or less throughout the entire field cultivated by us; for, as one of our iconoclastic members once said, no discovery in psychology is ever more than four months old. A second-best means to bring out the decennial features would be the exhibition of the annual changes by condensed and pointed statements descriptive of them. The fully capable surveyor might, perhaps, discover that there have not been ten ascending or cresting psychological interests. Instead of undertaking either of such accounts, some of the events and emphatic features of the decennium may receive descriptive presentation as follows:

The year of the beginning of our association, 1892, was a year of unusual interest, both at home and abroad. It marked what might well be called the 'psychological revival,' which deepened and perpetuated itself in institutional and extra-institutional organization. A dozen pages of 'Letters and Notes' in the April issue of the *American Journal of Psychology* ought to be transcribed in order to show the intensification of effort on all sides in the interest of psychological thinking, teaching and investigation. In August the second international Congress of Experimental Psychology (called 'experimental' the first time) was held in London, and Harvard University emphatically internationalized psychology among us by bringing Professor Münsterberg over the waters as the director of its psychological laboratory.

The year 1893 proved even more interesting historically. The first attempt in history to show internationally psychology in working order was made with the exhibit of experimental psychology, arranged by Professor Jastrow under the generous wings of anthropology, at the World's Columbian Exposition at Chicago. Here psychology was prepared in visual terms, being nothing less than a laboratory in operation, both as an exhibit and as a place for making 'tests.' Special mention should also be made of the significant congresses of rational psychology and of experimental psychology in education held during the exposition as part of the International Congress of Education under the charge of the National Educational Association of the United States. With but two exceptions in the experimental section, all the material presented before the two congresses came from our American students of the subject. The enthusiasm and attendance were rather unique. The same year witnessed a growing change of interest from the analysis of the mental states of the individual adult mind to the quest for the psychological roots of consciousness as these may be found in the psychical phenomena of the child and the lower animals.

For the cresting of a widespread popular interest in our science and its practical applications, the year 1894 will probably always stand out as remarkable. It was the great year of the formation of state

societies for stimulating and directing child study among teachers and parents. The American passion for novelty almost universalizes itself in the newer passion for collecting data and spreading the syllabus of inquiry. The National Educational Association had a new 'Committee on Psychological Inquiry,' which made its first report. The new theme of 'imitation' was so diligently pursued by psychologists, sociologists and educationists that they came near concluding that man is nothing else than an imitator. At least this process was regarded as the organizing function in the individual, enabling him to become a social unit. Our psychologists also seemed to take unusual delight in talking and writing about 'pain.'

The next year displayed a disturbance in the general feeling of confidence which had well settled down upon the cohorts of the psychologists. Some philosophers continued to deplore the transition of psychology into the state of a science, its adoption of exact methods in gathering accredited facts, etc. There appeared a strong reaction against the enthusiasm of the previous decade, and a decided doubt arose as to both the psychological character and the scientific value of the newer facts brought to light. These had received the name of the 'new' psychology, and it had to pass through the double baptism of fire and of praise as it was being steadily contrasted with the 'old' science. This reaction was doubtless the great crisis in the whole movement. Within the circle of psychologists this year was noteworthy by reason of more serious attention being given to that readjustment of methods and problems made necessary by bringing the great scheme of evolution up to the field of consciousness. The former physiological handmaid of the science was being surely replaced by her biological successor more effectively than ever before.

In 1896 several of the more important laboratories were moving into larger and better equipped quarters or were planning more space. Experimental activities were increasing. The popular magazines were giving unusual space to articles on psychology.

The year 1898 proved to be one of concentration, consternation and the experimental construction of the newer department of comparative or animal psychology. Those who held to the newer faith through the crisis of 1895 were moving forward constructively. Numerous articles on the arrangement and equipment of laboratories appeared. The problem of an 'individual' psychology attracted synthetic attention—not independently of foreign inquiries. Schemes of decisive tests were devised. Efforts began to be made to correlate all tests and measurements so as to sketch definitely the make-up of the normal mind, both in the formative and in the maturing ages. Certain complex functional activities involved in growth and in schooling were selected for careful analysis and patient investigation. And our late president recommended the introduction of 'the consulting psychologist' as the newest official in our educational system. But the practical applications of such and all other experimental results began at once to be seriously questioned by a large section of the educational public. This was but an echo of the warning note sounded by one of our members crying out against the dangers, not to say the absurdity, of an applied psychology. It is to be hoped that our science has fully regained by this time what was then so suddenly lost in general esteem, and as a useless sacrifice. Careful psychological experiments upon animals began to be made in several quarters, mark-

ing the tendency to develop this border province of the science. Out of this tendency, well stimulated in individual instances in previous years, has come a perfection and an extension of the more specific and exact modes of experimentation which prepared the way for the most satisfactory era of a definite comparative psychology, and a wider dependence upon the conceptions underlying a thoroughgoing application of the genetic method.

Of the unspoken years I am unable to specify accentuated activities, so even must have been the tenor of their way. Nor can one with ease put his finger upon the date of the introduction of the scientific method in those lines of interest in religion, in esthetics and in other higher manifestations of mind, which are enabling us to give a truer picture of the life-history of the soul, and which are now so well marked in their developments.

The decennium is also distinguished by the literary freedom and activity exhibited by our writers of treatises and text-books. I have not made it a part of my task to collect a summary of all the material available in this direction, but remained satisfied with an enumeration of some of the more important works which have appeared and which show in a different way the drift of the tendencies among us. In 1893 appeared Miss Shinn's 'Notes on the Development of a Child' (parts 1 and 2) and Tracy's 'The Psychology of Childhood.' The year 1894 saw the appearance of Ladd's 'Psychology Descriptive and Explanatory' and Marshall's 'Pain, Pleasure, and Æsthetics.' The first issue of 'The Psychological Index' was in 1895. It contained 1,312 entries, representing chiefly the bibliography, for the year preceding, of the literature of psychology and cognate subjects. Its latest issue, No. 8, for the year 1901, entered 2,985 titles. The following books also show the marked features of this year: Donaldson's 'The Growth of the Brain,' Stanley's 'Studies in the Evolutionary Psychology of Feelings' and Baldwin's 'Mental Development in the Child and the Race,' which was the beginning of a series of characteristic studies only now completing themselves. Ladd's 'Philosophy of Mind,' though treating of ultra-psychological questions, may also be mentioned as completing a unique trilogy on the soul. The year 1896 was fruitful in the following ways: Cope's 'The Primary Factors of Organic Evolution' had great value for the psychologist's problem of consciousness in evolution. The growing problems of social psychology received marked contributions in the work of Giddings, 'The Principles of Sociology.' And Baldwin's 'Dictionary of Philosophy and Psychology,' announced in this year, was expected to be ready in the following year. Even now the project is only two thirds completed. Scripture's 'The New Psychology' appeared in 1897. Throughout the decennium almost half a score of text-books for the subject have been prepared for class-room use, but the year 1898 might be called the year of psychological primers, by reason of the fact that two such books appeared. The same year saw a most interesting piece of pioneer work in the appearance of Sanford's 'A Course in Experimental Psychology, Part. I., Sensation and Perception.' In 1899 Starbuck gave completer form to his 'Psychology of Religion.' 1901 was a year unusually well marked by the appearance of the first volume of the 'Dictionary of Philosophy and Psychology' (though including the work of many hands not American) and Titchener's 'Experimental Psychology: A Manual of Laboratory Practice.'

The enrichment of American psychology through the translation of foreign works

into English should not pass unnoted, even with the briefest mention. Before the decennium began, we had Ribot's 'German Psychology of To-day' (1886), besides his works on heredity, attention, memory, personality and will, Preyer's 'The Mind of the Child' (2 vols., 1888 and 1889) and Höffding's 'Outlines of Psychology' through English hands, not to mention numerous other writings less typical of the dominant interests of psychology among us.

Within the ten years we have had Preyer's 'Mental Development of the Child' (1893), Wundt's 'Lectures on Human and Animal Psychology' (1894), Külpe's 'Outlines of Psychology' and Ziehen's 'Introduction to Physiological Psychology' (1895), Wundt's 'Outlines of Psychology' and Ribot's 'Psychology of the Emotions' (1897) and Groos's 'The Play of Animals' (1898) and 'The Play of Man' (1901). Most of this enrichment has come through the labor of American scholars, and is, therefore, interesting as indicating a continuance of the double debt our psychological thinking and activity owe to the foreign cultivators of our field of science.

In this connection an injustice would be done to the topic we have been surveying should we not remind ourselves of the fact that the output of our American psychologists has found place not only on the study shelves of our foreign brethren, but that also some of it has been transferred into the French, German and Italian languages. The following instances of such translations occur to me, but I can not say that the list is complete. Baldwin's 'Mental Development of the Child and the Race' appeared in French and German in 1896, his 'Social Interpretations' in 1899, his 'Story of the Mind' in French and Italian in 1899. James' 'The Will to Believe, etc.,' was translated into German in 1899, and his 'The Principles of Psychology' into Italian in 1900. Sanford's 'Course in Experimental Psychology' was translated into French in 1900, and a volume of Hall's studies has recently appeared in Germany under the title of 'Ausgewählte Beiträge zur Kinderpsychologie und Pädagogik.'

For our historical purposes it has been convenient to follow the lines of division between the activity within and the activity without the association. It is readily seen, however, that the widening interests of associational efforts, both individual and corporate, have been growing to include more and more of those achievements which we have reviewed as extra-associational. It is not possible, nor is it especially desirable, to give a quantitative statement of the claims the association may have upon this broader field. The healthy extension of its influences, though limited, is the fact to be noted. In how far it may be desirable that our psychology of the next ten years should be associational rather than individual is a question of development too large for the concluding words for which we have space.

One can not be truly historical without becoming prophetic. The prophecy may lie in inert words, lacking the momentum of a vigorous inspiration. In looking forward to the psychology that is to be among us, there are many means which I should like to point out as available by our association for the realization of certain desirable developments of our science both within and without. Its representation in our universities, colleges and secondary schools, the methods of teaching it to learners, of establishing its integrity more securely, and of extending its borders by investigations, and the specific contributions it has to offer to the welfare of the individual and of society, constitute the heart of vital problems which must come

more and more into the deliberations of our organization as a national court of appeal in such issues. The association truly has a solemn duty to perform in keeping in touch with the changing social and educational conditions in our national life and in seeing to it that the interests of psychology are adjusted to them. In spite of the experimental showing made in our statistical studies above, somewhere answer must be found for the questions persistently raised by the fact that the laboratory of psychology has not held its men like the other types of laboratory developed by science.

All these and several other vital questions relating to the efficiency of the association must be passed over to give place for a final suggestion. I doubt whether any person outside the council ever reads the reports dutifully presented by the treasurer. At the close of ten years we are in possession of a fund of some sixteen hundred dollars. The current expenses of the organization being kept reduced to a nominal minimum, the fund receives at the present rate an annual accumulation of nearly four hundred dollars. Should this rate of increase continue, the fund will be almost doubled in four years. Herein the association finds itself happily invested with both an obligation and an opportunity. This fund should be so administered as to yield the most stimulating returns in influence upon the growth of our science, especially in America. This can be done, not by burying or dissipating it in minor projects, worthy perhaps in their way and for the time being, but only by aiming high. The best effort the association can make seems to me to lie in the direction of establishing a *Prize Gold Medal in psychology* —a suggestion for which I take pleasure in thanking our president. The interest income of our fund four years hence would be sufficient to warrant the awarding of the medal every three years, or four at most. This medal should be awarded by the association only for the best piece of work done in psychology, either in research or in some other specific mode of advancing its multiple interests. The association might control the direction of the immediately future psychological thinking by setting a prize problem, or it might stimulate general efficiency on the part of psychologists by selecting the best work in unspecified lines for the high honor going with the medal distinction. The field of competition might be restricted to American psychologists, or left open to the world. This prize gold medal might even be designated by the honored name of some past or present American psychologist. But my suggestion does not include a draft of rules regulating the award of the medal. It remains for me only to express my deep conviction that more enthusiasm and inspiration would be infused into American psychology through such a foundation, which is perfectly possible, than through any other detailed project that could be suggested at the present time. Its great virtue resides in the fact that it would keep each worker looking forward and upward, and that through it the association would do a thing of great and lasting moment.

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SCIENTIFIC BOOKS.

Standard Polyphase Apparatus and Systems. By MAURICE A. OUDIN. Third edition, revised. New York, D. Van Nostrand Company. Crown 8vo. Pp. 289. $3.00.

Students of electrical engineering have welcomed this up-to-date revision of Oudin's book on polyphase machinery, covering, as it

does in a very satisfactory manner, the chief features of the most recent developments in electrical engineering.

Chapter I. is devoted to definitions of terms and Chapters XII., XIII. and XIV. are devoted to the more or less theoretical questions of choice of frequency, weights of copper for various systems and calculation of transmission lines. The remaining chapters II. to XI. are devoted to the details of structure and operation of alternating current machinery of the polyphase type; and in an appendix is given the full report of the committee on standardization (of electrical machinery) of the American Institute of Electrical Engineers.

The author gives expression in his preface to a statement which has been current among electrical engineers for some time, namely that the most progressive engineering work of the day is that of switchboard design. The truth of this statement may be realized if we remember that the switchboard in a station includes all the controlling, regulating and safety devices, and that with the coming of our enormously powerful high-voltage generators the switchboard designer faces some of the most perplexing problems that have ever confronted electrical engineers.

W. S. Franklin.

Arithmetic of Electrical Measurements. By W. R. P. Hobbs. Ninth edition, revised by Richard Wormell. London, Thomas Murby. 1902. Crown 8vo. Pp. 112. 50 cents.

This is an excellent collection of simple problems illustrating the principles of current electricity. The problems are arranged in thirteen chapters and at the beginning of each chapter is given a series of explanatory paragraphs. An undue proportion of the problems are devoted to battery calculations such as grow out of series and parallel connections, while many important phases of modern electrical engineering are wholly untouched.

W. S. Franklin.

SCIENTIFIC JOURNALS AND ARTICLES.

The American Naturalist for June contains the first instalment of an article on 'The Colors of Northern Gamopetalous Flowers,' John H. Lowell; this is devoted mainly to a presentation of the character and colors of the flowers of the various orders of the group, though at the close we have a hint that bees have been largely instrumental in bringing about the survival of certain colored flowers. J. H. Powers discusses 'The Causes of Acceleration and Retardation in the Metamorphosis of *Amblystoma tigrinum*,' bringing forward a number of facts to show that the chief factor in change is a reduction in the food supply and not an insufficient supply of water for respiration by gills. Bradley Moore Davis considers at some length 'The Origin of the Sporophyte' and the balance of the number is devoted to notes and reviews.

The Popular Science Monthly for August opens with an article by Sir Oliver Lodge, on 'Modern Views on Matter,' the Romanes Lecture at Oxford; David Starr Jordan considers 'The Training of a Physician' and W. LeConte Stevens 'American Titles and Distinctions,' implying that here they are all too cheap. C. C. Nutting describes, with the aid of illustrations, 'The Bird Rookeries on the Island of Laysan'; Albert Schneider discusses 'Bacteria in Modern Agriculture,' showing what it is hoped to do by the aid of bacteria rather than what has actually been accomplished; and J. E. G. de Montmorency gives the second part of 'The Story of English Education,' bringing the subject down to date. Frederick A. Bushee has an article on 'The Declining Birth Rate and its Cause,' and J. A. Fleming the third instalment of a paper on 'Hertzian Wave Wireless Telegraphy.' There are many matters of interest discussed in 'The Progress of Science.'

The Museums Journal of Great Britain for June brings to a close the second volume of this valuable periodical, which comprises some 375 pages, besides the full index, and supplementary pages devoted to a directory of the Museums of Great Britain. Mr. Hoyle is to be complimented on the regularity with which the *Journal* has appeared and congratulated on the fact that he has made it a financial success.

WITH the July number *The American Museum Journal* begins its appearance as a quarterly. The leading article, illustrated, is on 'Martinique and St. Vincent Revisited,' by E. O. Hovey. Accessions are noted in various departments as well as the complete rearrangement of the halls of vertebrate paleontology on the alcove system, so that the attention of the visitor is concentrated on a given group. In connection with forthcoming improvements it is announced that two assembly rooms will be provided for the use of scientific societies. The supplement to the number, 'Guide Leaflet No. 11,' is devoted to a description of 'The Musical Instruments of the Incas,' by Charles W. Mead.

Bird-lore for July–August contains articles on 'The Bird Life of Cobbs' Island,' by Frank M. Chapman; 'In the Haunts of New Zealand Birds,' by Charles Keeler; 'The Loggerhead Shrike in Massachusetts,' by Jane Atherton Wright; 'System in Field Records,' by Eugene Murray-Aaron and 'Some Notes on the Psychology of Birds,' by C. William Beebe. There are the usual notes and reviews, and among the illustrations the fifth series of portraits of *Bird-Lore's* Advisory Councilors.

DISCUSSION AND CORRESPONDENCE.

ADDITIONAL FACTS CONCERNING THE BATH FURNACE METEORIC FALL OF NOVEMBER 15, 1902.

TO THE EDITOR OF SCIENCE: Since the announcement concerning Bath Furnace Aerolite No. 1, which appeared in SCIENCE of January 16, two other pieces have been found; one picked up within one hundred yards of where No. 1 fell, and the other one three fourth mile south of this. Named in the order in which they have been found, we have designated these as No. 2 and No. 3, respectively.

No. 2 weighed 223 grams. It was completely coated with the black enamel or varnish and pitted. It has been sawed into two pieces: one for the Field Columbian Museum and the other for the Kentucky State College Museum. It has the same specific gravity and presents the same interior appearance as Bath Furnace No. 1.

No. 3, found about the middle of May last, by a hunter who was led to search for it by noticing a skinned place some distance up on a white oak sapling, will weigh about 200 pounds. It is also completely coated with the black enamel, and is very characteristically pitted and furrowed. These furrows radiate from a smooth nose or boss. It was this portion which bruised its way downward into the base and roots of the tree. The side opposite to this is flat and not furrowed nor pitted, but presents a few nodular excrescences.

As a result of visiting the locality, examining the places where the pieces struck and securing the accounts of the residents, all of whom were much startled by the blinding light and terrific detonations accompanying the fall, I gather the following: There was probably one mass originally, which burst at a height of from eight to nine miles into many fragments. These fragments struck the earth in a district some four miles square, situated in the knobs of the extreme southern portion of Bath County. Most of the region is thinly populated. No. 3 was found almost in the center of this thinly populated district. The accounts given by the residents of the noise made by the 'explosion,' of the singing of the fragments as they hurtled through the air, and the sound made by their striking the ground or hitting the timber on the knobs, were very graphic.

No. 3, which is probably the main portion of the original mass, has left some record from which possibly the trajectory of this celestial body may be computed. From the way in which it grazed the sapling in its descent, and bruised its way into the roots of the tree at the base of which it was found, I estimate that it came in from a direction 13 degrees south of west, and at an angle from the horizontal of 77 degrees. As previously announced, the altitude of the point of the bursting of the meteor, as seen from Lexington, was 9 degrees and 30 minutes. The azimuth of this point is N. 81 degrees E. The point of fall, however, plots out on

the map almost due east of Lexington, and distant 51 miles.

Two other saplings in the vicinity of where No. 3 fell, distant, respectively, about 100 and 200 yards, in an easterly direction, have been broken off by missiles striking them from the west. Search for where these buried themselves in the ground was not rewarded with success.

The dent in the road made by No. 1 had become obliterated, but from the accounts of those who saw it soon after it was made, it dipped eastward, and so is in line with the evidence afforded by the other fragments.

Arthur M. Miller.

State College of Kentucky.

THE PROTECTIVE FUNCTION OF RAPHIDES.

To the Editor of Science: In view of Dr. Wiley's interesting account (printed in Science of July 24) of the raphides of *Colocasia antiquorum*, it may be worth while to quote the description of these crystals and the cells containing them given by Haberlandt in his 'Physiologische Pflanzenanatomie,' edition 2, pp. 448, 449, 1896, translating literally:

"That in numerous cases the crystals of calcium oxalate, when they occur as raphides or spear-shaped crystals, are also to be regarded as functioning secondarily as a mechanical means of protection against animals that would feed upon the plant, is beyond doubt. Schroff has proved that the irritating effect of the sap of the bulb of *Scilla maritima* depends upon the penetration of the skin by the raphides, and that filtered sap produces no irritation. Stahl* afterwards demonstrated the same thing as holding true for other plants, especially *Arum maculatum*, and showed by experiment that leaves of that plant, when merely treated with alcohol, were hardly touched by snails, while on the other hand, leaves treated with dilute hydrochloric acid, in which the raphides were dissolved, were very quickly devoured. The ejection of the numerous crystal needles from the cell containing them is largely effected through the absorption of water by the strongly swelling mucilaginous substance which always encloses the bundle of raphides. That the form of the containing cell, as well as the manner in which its walls are thickened, is in many cases an adaptation to the protective function of the raphides, is indicated by the following example.

"In the leaves of *Pistia Stratiotes* [which like *Colocasia* and *Arisæma* belongs to the Arum family], the one-layered plates of parenchyma that make up the aerenchyma (breathing tissue) contain transversely placed, spindle-shaped, elongated cells [almost cigar-shaped in Haberlandt's figure] containing raphides. Both ends of these cells project into the intercellular air spaces. The blunt ends of these cells have an extremely delicate cell wall, while the rest of the cell wall is rather thick, although not cutinized. Upon mechanical injury to the cell, although not, however, through the simple presence of water, the raphides are ejected, generally one at a time, with considerable force through the swelling mucilaginous envelope, whereby the thin portion of the cell wall is pierced and soon completely disappears. The place of exit of the raphides is in this case determined by the thin part of the wall and, furthermore, the conical tapering of the ends of the cells prevents the whole bundle of raphides being ejected at once. As the raphides are projected one after the other, the attacking animal can be wounded in different parts of the body."

Thos. H. Kearney.

* The utility of raphides in protecting plants from snails is quite fully discussed by Stahl in his interesting paper entitled 'Pflanzen und Schnecken: Eine biologische Studie über die Schutzmittel der Pflanzen gegen Schneckenfrass,' *Jenaischen Zeitschrift für Naturw. und Med.*, Vol. 22, pp. 84–99 of the reprint.

SHORTER ARTICLES.

CARBONIFEROUS FOSSILS IN 'OCOEE' SLATES IN ALABAMA.

The age of the semi-crystalline and crystalline schists which extend in continuous belt from New England to Alabama, has long been a subject of discussion and of wide difference of opinion among geologists. On the one hand, they have been considered as pre-Cambrian;

on the other, they have been identified as metamorphosed Paleozoic sediments. At the northern end of this belt it has been possible, by means of the fossils, by tracing them into unaltered fossiliferous beds, and by their stratigraphic relations, to assign parts of these slates to Paleozoic formations. Thus the 'Archæan' of southeastern New York has been proved to be largely of Cambrian and Ordovician age, and the highly crystalline mica schists of New York island are now assigned to the Hudson river horizon. Further southward in Pennsylvania and Maryland a similar change in the reference seems to be taking place, as is evidenced by the recent work of Miss Bascom.

The semi-metamorphic slates and conglomerates constituting the Ocoee of Dr. Safford have in like manner been variously classified. Dr. Safford considered them as of Silurian (Cambrian) age, but as occupying a position below the oldest of his fossiliferous Silurian divisions, the Chilhowee. Mr. Arthur Keith at one time, from their superposition and structure, reached the conclusion that these rocks were in part at least of Carboniferous age, but detailed mapping and study of the sedimentary formations of the North-Carolina-Tennessee mountains and the tracing of the different layers from place to place, have enabled him to prove to the satisfaction of the geologists conversant with that region that the Ocoee strata along or near the state boundary line are of Cambrian age, and correspond in the main to the lower part of the section shown in Chilhowee Mountain. In this he confirms Dr. Safford.

Mr. E. C. Eckel, in papers* dealing with the gold deposits of the Dahlonega district of Georgia, has suggested incidentally that both the Ocoee rocks proper and the more highly metamorphosed rocks east of them are probably of Paleozoic age, and may possibly be in part of late Paleozoic age; while the Dahlonega gold deposits were certainly formed not earlier than the Ordovician and possibly as late as the Carboniferous. These conclusions were based upon the structural relations of the deposits, and were supported by analogy with similar rocks and deposits in Tennessee, Virginia and New York.

From these notes it will appear that conclusions as to the age of the Ocoee have heretofore been based upon their stratigraphy and structure, *i. e.*, upon circumstantial evidence, and it will, no doubt, be of interest to readers of SCIENCE to know that we have now *definite paleontological evidence* of the age of a part, at least, of these rocks.

In November, 1902, I received from Mr. Joshua Franklin, of Mosely, Clay County, Ala., some fossils obtained by him from the slates near his house. These were submitted to Mr. David White, of the National Museum, for identification, but it was not until May of the present year that I had the opportunity of visiting the locality and noting the mode of occurrence of the fossils. The locality is at the eastern base of the main range of the Talladega Mountains and at a distance of eight miles or more from the contact of the 'Ocoee' with the unaltered Cambrian of the valley. The slates in which the fossils are found are the ordinary semi-crystalline (sericite) slates of the Ocoee type. At the point in question these slates are in places highly charged with graphitic matter, which is particularly in evidence in freshly exposed rocks in a railroad cut. Where they have been long exposed at the surface they have lost in great measure this graphitic matter and are of the usual bluish and yellowish colors and silky luster. The fossils are mostly found in concretions, usually lens-shaped, but occasionally longer in one dimension; the concretions are very perceptibly lighter in specific gravity than the rock itself; when broken open they are sometimes found to hold badly preserved organic forms; sometimes they are hollow, the organic matter having apparently been removed by decay, leaving only a loose powdery silicious residue filling only a part of the cavity. Other fossils, and among them the most perfect one (a *Lepidostrobus*), are found loose, and, while they have not yet been specifically identified, appear to be pieces of stems

* *Engineering and Mining Journal*, February 7, 1903; Bull. 213 U. S. Geol. Survey.

of *Lepidodendron, Calamites* and *Artisia.* Like the concretions, these fossils are generally considerably lighter in weight than the ordinary rock. It is interesting also to note that I found several thin veins of turquoise in the slates of the railroad cut above mentioned. The same mineral had been previously observed in thin veins in a much more highly crystalline mica schist a few miles distant from this locality. Mr. Franklin has also given me a piece of quartz showing free gold which he says he found in the same slates that carry the fossils, and indeed in the near vicinity of this find, precisely similar slates, to all appearance, carry quartz veins that have been worked for gold for many years. I collected the fossils along this belt of slates for a distance of a mile or more, and while they are not particularly abundant, I was able in the course of an hour to get fifty or more specimens.

Mr. David White, to whom the best specimens were sent, writes me as follows: "The fossils you sent me are most interesting and important on account of their bearing on the classification of the formation from which they were derived. The biological problem is hardly less interesting to me, for it is but the second lepidophytic cone fragment showing microscopical structure that has turned up in our Paleozoics, so far as I am aware. Another larger specimen in hand is from a Carboniferous limestone in the Indian Territory. Your specimens represent several fragments of large cones in which the axes, the basal, sporangiferous portions of the spirally arranged bracts, the rhomboidal compressed sporangia and the megaspores are well defined. Precise identification of the material is deferred pending the study of thin sections and the determination of certain points regarding the sporangial walls and their attachment to the basal portions of the bracts. It is clear, however, that we have here fragments of cones whose superficial features appear to represent the common *Lepidostrobus* type of the upper Paleozoic. Beds containing lepidophytic remains of this type can hardly be older than Devonian at earliest, and should not antedate the Middle Devonian.

"The general proportions and aspect of the cones are suggestive of some of the Carboniferous forms. Although the internal structure of the strobili may be found to indicate a more highly organized genus than *Lepidostrobus,* we may rest assured that the material is not older than the Upper Paleozoic lepidophytes."

We can now safely say that the Ocoee of Alabama includes the metamorphosed sediments of more than one of the Paleozoic formations, but it may be doubted if conclusive paleontological evidence of the age will be found in many cases, since the fossils will inevitably be obliterated in all the more highly crystalline of these schists.

Eugene A. Smith.

University of Alabama,
June 6, 1903.

BOTANICAL NOTES.

TWO INTERESTING PARASITIC PLANTS.

In a recent bulletin of the Kentucky Experiment Station, Professor Garman describes two parasitic plants which are considerably out of the ordinary line. They are the broomrapes of the genus *Orobanche.* They are small plants related to the figworts, but destitute of any green color. Their roots are attached to the roots of various plants, and in this way they steal the food matters which, were they honest, they would secure for themselves from the soil and air. The first species described, *O. ramosa,* is parasitic to a considerable extent on tobacco and hemp in Kentucky, doing a good deal of damage. The second is *O. ludoviciana,* a native species very common on the western plains. This is also found to be parasitic on the hemp in Kentucky. These two species have been carefully investigated by Professor Garman, and he makes some suggestions in regard to their eradication. He finds that is impracticable to remove the parasites from the growing crop of hemp, but it is practicable to remove them from the tobacco crop. It is found impracticable to remove the rape seeds from hemp seed by flotation. Soak-

ing the hemp seed in bluestone solution will kill the rape seeds, but not the hemp. Water heated to 140° F. appears not to hurt hemp seeds, but the rape seeds are destroyed by this temperature. It is found that the rape seeds maintain their vitality for at least thirteen years in the soil. Professor Garman insists upon it that by the use of improved machinery the rape seeds may be largely removed from the hemp seed. The application of lime, salt, etc., to the soil is found to have no value.

THE STUDY OF GALLS.

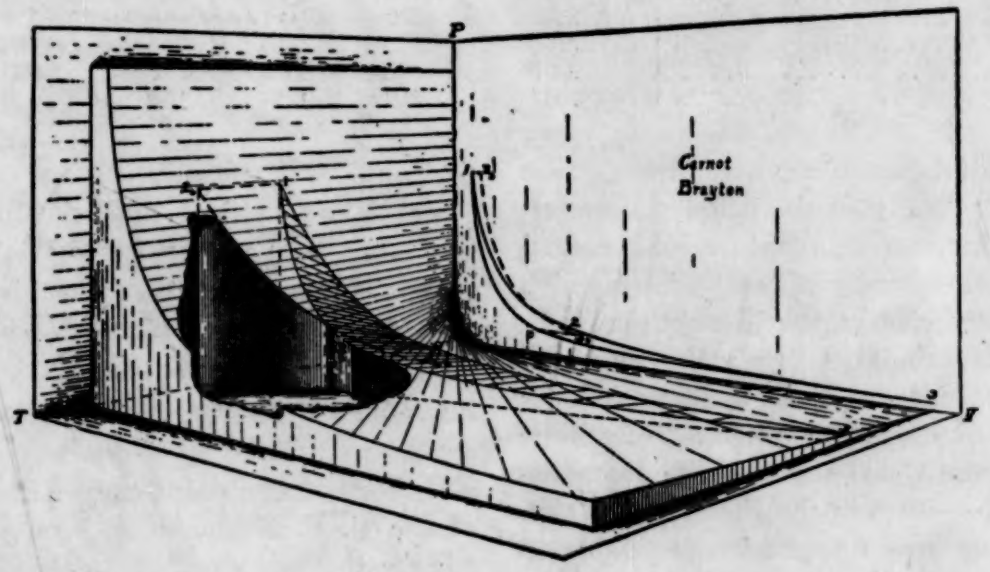
SOME time ago a notice was made in these columns of a book of Edward Connold, of England, entitled 'British Vegetable Galls,' and the suggestion was made that in America this field of inquiry is practically uninvaded. We are glad to know that Professor M. T. Cook, of DePauw University, has been giving attention to these structures for some time. We have before us two bulletins issued by the Ohio State University devoted to 'Galls, and Insects Producing Them,' by Professor Cook. This article is a preliminary publication which promises a much more extended publication in the future. The article as at present published includes 'Morphology of Leaf Galls,' 'Apical Bud Galls,' 'Lateral Bud Galls,' 'Stem Galls' and 'Development of Galls.' It is the intention of Professor Cook to continue this work, enlarging the scope of his inquiries until he has material enough for an extended publication. We may, therefore, confidently expect an American volume comparable to Connold's British volume referred to above.

CHARLES E. BESSEY.

UNIVERSITY OF NEBRASKA.

'GRAPHICS OF THERMODYNAMICS.'

MESSRS. BATES AND WELBORN, in the *Sibley Journal of Engineering*, present an interesting study of the relations of five gas-engine type-cycles and graphically exhibit their characteristics in three-dimension diagrams which



Characteristics of Cycles.

strikingly illustrate the text.* A common compression line is assumed and the same amount of work is performed by each cycle; all performing similar work with similar heat-supply, under these conditions, as indicated by Röntgen's theorem.

All heat-engines employing a perfect gas as working substance, in a cycle composed of a pair of adiabatics crossed by a pair of isodia-

* *Sibley Journal of Mechanical Engineering*, June, 1903, p. 372. *Vide* 'Thermal Lines on Isometric Planes,' *Sibley Journal*, February, 1900, by R. H. T.; 'Graphic Diagrams and Glyptic Models,' *Jour. Franklin Inst.*, January, 1896, by R. H. T.

batics, have the efficiency $(T_1 - T_0)/T_1$, where T_1 and T_0 are the temperatures of the terminals of the compression line.

Adopting the methods of the writer, the following data are obtained.*

CHARACTERISTICS OF TYPE-CYCLES.

	Absolute Pressure Lbs. per sq. in.				Absolute Temperature.			
	p_0	p_1	p_2	p_3	T_0	T_1	T_2	T_3
Carnot	15	115	23.8	3.11	520	931	931	520
Otto	15	115	188.3	24.5	520	931	1522.7	852
Brayton	15	115	115	15	520	931	1352.7	755
Ericsson	15	72.3	72.3	15	520	520	931	931
Stirling	15	72.3	133	27	520	520	931	931

	Volumes.				Maximum Pressure.	Maximum Temperature.	Maximum Volume.
	V_0	V_1	V_2	V_3			
Carnot	1	.2334	1.125	4.82	115	931	4.83
Otto	1	.2334	.233	1	188.3	1522.7	1.00
Brayton	1	.2334	.338	1.45	115	1352.7	1.45
Ericsson	1	.207	.372	1.79	73	931	1.00
Stirling	1	.207	.207	1	130	931	1.80

The characteristics of the several cycles are displayed graphically in the usual manner on pressure-volume, on temperature-volume, and on temperature-entropy planes, all of which bring out very clearly the distinctions indicated by the tabulated data; the principal being the great volume of the working cylinder for the Carnot cycle, the comparatively large pressures of the Otto—the Beau de Rochas—and the low pressures of the Ericsson diagram. The Carnot cycle is thought impracticable on account of engine volume, weight and cost; the Beau de Rochas involves very high temperatures and pressures and the Ericsson and Stirling engines seem likely to waste largely by dissipation of heat.

"The Brayton, on the whole, seems to promise best and, while practical obstacles modify any application, it yet remains true that recent reports would seem to place engines operating in this cycle in the lead."

The most novel and perhaps immediately interesting feature of the paper is its illustrations of the cycles discussed by forms in relief. The accompanying engraving is an illustration of one of these—a comparison of the Carnot and the Brayton cycles, referring co-ordinates to pressure, volume and temperature planes. The two cycles are seen in usual form on the p-v plane and their respective diagrams are indicated throughout the figure by full lines for the Carnot, dotted lines for Brayton. The numerals 1 and 1_0, 2 and 2_0, 3 and 3_0, respectively, indicate the same distinction. The common initial point of the diagrams is seen at 0.

R. H. THURSTON.

* Manual of the Steam-Engine,' Vol. I., p. 418.

EXHIBIT OF THE U. S. NATIONAL MUSEUM AT ST. LOUIS.

THE most striking feature of the exhibit of the U. S. National Museum at St. Louis will be the reproduction of a full grown sulphur-bottom whale. The mold for this was obtained through the courtesy of the Cabot Steam Whaling Co. at their station at Balena, Newfoundland, and was made from one of the largest whales taken this summer; a skeleton of the same species was presented by the Colonial Manufacturing Co., of St. Johns, Newfoundland. As definite measures and weights of whales are not easily obtainable some details on these points may be of interest. The animal, a male, from which the skeleton was procured, measured 74 ft., 8 in. from the notch of the flukes to the tip of the nose, or 79 ft. from tip of flukes to tip of lower jaw. The girth around shoulders was 35 ft. and the width of the flukes 16 ft., 5 in. The skull, over all, measured 19 ft. and the width across

the orbits was 9 ft., 3 in.; the length of the jaws was 20 ft. along the outer curve, while the combined weight of cranium and jaws was four tons.

The approximate weight of a specimen of this size, as determined by Mr. S. C. Ruck, are as follows:

	Pounds.
Weight of bones	17,920
Weight of blubber	17,920
Weight of flesh	89,600
Weight of whalebone, including the attached gum	1,750
Weight of viscera and blood, estimated	13,440
Total	140,630

or not far from 63 tons. F. A. L.

*MEMORIAL TO SIR WILLIAM FLOWER.**

My Lord Archbishop, Ladies and Gentlemen:

The late Sir William Flower, formerly director of this museum, was one of my oldest and most intimate friends. It was, therefore, with great pleasure that I agreed to the request of the Flower Memorial Committee to say a few words on the occasion of the presentation to the trustees of the bust of the late director.

The bust which, as you will presently see, so well represents the kindly countenance of our deceased friend, is the work of Mr. Thomas Brock, R.A., and no one, I think, will deny that the talented artist has achieved a remarkable success in producing it. But before formally presenting it I may venture to say a few words about him whose memory we seek to honor on the present occasion, and about the excellent scientific work which he performed.

Born in 1831, Flower was a member of a well-known family of Stratford-on-Avon, and, showing remarkable taste for natural history in his early youth, was educated for the medical profession. He graduated at the University of London in 1851 and became a member of the Royal College of Surgeons the same year. In 1852 he read a paper to the Zoological Society on the structure of a species of *Lemur*, the first of a long series of communications to that society which continued for forty-five years.

In 1854, on the Crimean War breaking out, Flower joined the Army Medical Staff, and was present at the battles of Alma, Balaclava and Inkerman, and at the capture of Sevastopool, and afterwards did good work in the British Hospital at Scutari, in acknowledgment of which he received the Crimean medals.

On returning to England, Flower quickly reverted to natural history, and in 1855 was appointed demonstrator of anatomy to the Middlesex Hospital and curator of its museum. Here he did excellent work, and so plainly showed the stuff that he was made of, that six years later, in 1861, on the death of Queckett, he was appointed conservator of the museum of the Royal College of Surgeons. This important post Flower held for twenty-two years and, as we all know, carried out its duties in a most effectual manner. When the president of the Royal Society delivered to Flower the Royal medal in 1882, he said: 'It is very largely due to Professor Flower's incessant and well-directed labors that the museum of the Royal College of Surgeons contains the most complete, the best ordered and the most accessible collection of materials for the study of vertebrate structure in existence.'

From 1870 to 1884 Flower was Hunterian professor of comparative anatomy and physiology, and gave the admirable courses of lectures on these subjects which have rendered his name famous in the annals of zoological science.

In 1879, on the death of Lord Tweeddale, Flower was unanimously elected president of the Zoological Society of London, upon the council of which he had served for many years previously, and retained this post until his death in 1899. In 1884 the directorship of the great Natural History Museum in which we are now assembled became vacant by the death of Professor Owen, and Flower, being *omnium consensu* most admirably fitted for it, was selected for the post. Of the way in which he performed the heavy duties of this

* Full text of Dr. Sclater's address on the occasion of the presentation of a bust of the late Sir William Flower to the trustees of the British Museum, July 25, 1902.

office it is quite unnecessary for me to speak to the present company. It must suffice to say that the whole of his time and all his great abilities were devoted to the performance of the multifarious business of this important position.

In 1899 Flower was president of the British Association at Newcastle-upon-Tyne, and devoted his presidential address mainly to museums and their arrangement. This was, no doubt, one of his favorite subjects, and Virchow, of Berlin, is said to have called him the 'Prince of Museum Directors.' Thus we see that Flower had occupied three of the most exalted and conspicuous posts that any devotee of zoology could hope to attain—the directorship of the Natural History Museum, the presidentship of the British Association and the presidentship of the Zoological Society of London. Besides this he was selected for the presidency of the International Congress of Zoologists which met at Cambridge in 1898, but the unfortunate failure of his health compelled him to surrender this last appointment.

In zoology, no doubt, Flower's chief subject was the class of mammals, and the work by which he will probably be best known to posterity is his volume entitled 'Mammals, Living and Extinct,' published in 1891, in which he was assisted by Mr. Lydekker. This admirable hand-book is, and will long remain, our standard work of reference for students of the class of mammals.

A distinguished writer has well said: "No comparative anatomist of recent times has more devotedly or with greater ability and accuracy studied mammals. Moreover, in every instance he has enlarged our knowledge by his acute and comprehensive views, and, since the range of his contributions passes from the monotremes to the primates his influence on the subject has been immense.

"The labors of his life culminated in the magnificent series of whales, which it was one of his last duties to arrange and exhibit in a remarkably ingenious manner.

"While a splendid series of mounted skins, models and skeletons themselves can be studied in the whale room numerous drawings and labels enable the visitor to grasp still further the form and structure of these gigantic denizens of the deep. No more fitting memorial of the skilful hand of the leading authority on the subject could be found than this marvelous and unique collection."

And no more fitting situation, I think, it will be generally acknowledged, could be found for the bust, which so well recalls the features of the deceased naturalist, than the whale room which he planned and furnished, and in which, I believe, it is proposed to place it.

My Lord Archbishop:

In the name and on behalf of the 185 subscribers to the 'Flower Memorial Fund' (which has received the generous support of the zoologists of nearly every part of the world) I beg leave to offer this bust for the acceptance of the trustees of the British Museum.

THE INTERNATIONAL COMMISSION OF ARCHEOLOGY AND ETHNOLOGY.

A MOVEMENT promising to effect much in the way of stimulating scientific and historical research throughout the western hemisphere, and perhaps even more in the direction of bringing about close and more harmonious relations among the several American republics, was initiated at the second International American Conference in the City of Mexico in January, 1902. The first step was taken by Hon. Volney W. Foster, of Chicago, one of the representatives of the United States in the conference; with the cooperation of Señor Don Alfredo Chavero and others, he introduced a resolution providing for an International Commission of Archeology, which was adopted by the conference and recommended to the several participating countries in the volume of 'Recomendaciones, Resoluciones, Convenciones y Tratados,' issued later in the same year. The first of the American republics to take action in accordance with the recommendation of the conference was Mexico; in October last President Diaz appointed Señor Chavero as a representative on the part of the Mexican government to confer with similar representatives from other countries concerning procedure toward the organization of the commission. Dr. Chavero visited

Washington and New York during the Congress of Americanists later in the same month, and seized the opportunity to confer with the leading archeologists of the western hemisphere. Before returning to Mexico, he framed a plan in accordance with which the Mexican ambassador to the United States, His Excellency Señor Don Manuel de Aspiroz, was more formally appointed as a representative of the commission and empowered to treat with the diplomatic representatives of other American countries.

Meantime the movement attracted some attention in the United States; at meetings in Pittsburg early in July both the American Association for the Advancement of Science and the American Anthropological Association passed resolutions approving the general plans for the commission; and on November 13, our secretary of state, Hon. John Hay, appointed Dr. W J McGee as a representative on the part of the United States to confer with similar representatives from other American countries. Dr. McGee visited the City of Mexico, where he conferred with Señor Chavero and other officials interested in the project, including President Diaz; and after his return, he cooperated with Ambassador Aspiroz in developing a plan of organization for the commission.

On April 15, 1903, a meeting of the diplomatic representatives of the American republics was convoked in the State Department, at which the plan proposed by Messers. Aspiroz and McGee was formally adopted for transmittal to the several governments. Of these, six or seven had already taken favorable action; and it was the expressed desire of the meeting to obtain formal approval from the governments of the remaining republics.

The second article of the regulations in which the plan of organization of the commission is embodied provides:

> The objects of the Commission shall be (1) to promote the unification of laws relating to antiquities in the Western Hemisphere; (2) to increase and diffuse knowledge concerning these antiquities and the aboriginal peoples by whom they were produced; (3) to awaken interest in the vestiges of a vanishing race; (4) to unify museum methods throughout the American countries, and (5) to work for the establishment of one or more archeologic and ethnologic museums of international character.
>
> The third article provides that the Commission shall form an Administrative Corps and include a Scientific Corps.

The commission in its administrative capacity will consist of representatives officially designated by the participating governments to a number not exceeding three from each; the officers being a president, three vice-presidents and a secretary—all elected by the commissioners at stated sessions. The scientific corps will consist of scientists to the number of one or more from each participating country, and scientific attachés, the latter assigned to work so far as practicable in countries other than those in which they were trained. The officers of the scientific corps will be a director general and a secretary, with a director for each participating country; these officers will be nominated by the scientific corps and elected by the commissioners; and the plan provides for filling *ad interim* vacancies.

As a public office the commission will be maintained chiefly by appropriations in and for the participating countries on a basis corresponding with those made for the International Bureau of American Republics; but it is planned to utilize donations of service, collections, money and other values. In accordance with the original recommendation of the International Conference accounts will be kept in the Bureau of American Republics. Provision is made for stated sessions both of the scientific corps and of the commission in December of each year, and also for the publication of reports.

On April 20, Hon. W. W. Rockhill, director of the Bureau of American Republics, formally communicated the action of the diplomatic representatives to the several legations; while the representative of the United States reported progress to our secretary of state and recommended the appointment of the three commissioners provided for in the plan of organization. Action was soon taken on the recommendation, and the commissioners were

appointed. They are Hon. Volney W. Foster, the representative of the United States in the International Conference, to whose initiative the movement is due; Dr. W J McGee, president of the American Anthropological Association, long ethnologist-in-charge of the Bureau of American Ethnology, and now chief of the Department of Anthropology in the Louisiana Purchase Exposition; and Professor Francis W. Kelsey, of the University of Michigan, secretary of the Archeological Institute of America.

On August 7, the American commissioners met in Evanston with the object of studying the plan of organization and preparing themselves to meet their associates from other countries at the organizing session on the third Monday in December next. The plan of organization adopted at the meeting of the diplomatic representatives on April 15 was found acceptable in all its general provisions, though a few minor changes were suggested. Informal advices indicate that corresponding action has been taken in Mexico and two or three other American republics; so that the outlook for the organization seems promising.

SCIENTIFIC NOTES AND NEWS.

As we have already stated Professors Simon Newcomb, Hugo Münsterberg and Albion W. Small, the committee in charge of the Congress of Arts and Sciences of the Louisiana Purchase Exposition, are at present abroad making arrangements and issuing invitations in connection with the congress. Mr. Joseph B. Gilder writes to the Boston *Transcript* stating that more than sixty foreign delegates have accepted the invitation, including in mathematics, MM. J. G. Darboux, Émile Picard and J. H. Poincaré, of Paris; and Professor O. Boltzmann, of Vienna. In chemistry, Professors James Dewar, of London; W. Ostwald, of Leipzig; and J. H. Van't Hoff, of Berlin. In astronomy, Professors H. H. Turner, of Oxford; and W. Kapteyn, of Utrecht. In geology and mineralogy, Professors Ferdinand Zirkel, of Leipzig; C. Weigert, of Frankfort; and Sir Archibald Geikie and Dr. Hugh Robert Mill, of London. In biology, Professors K. Goebel, of Munich; Max Fürbringer, of Heidelberg; Felix Marchand, of Leipzig; Alfred M. Giard and L. Manouvrier, of Paris; and Wilhelm Waldeyer, Oskar Hertwig, Wilhelm Engelmann and Albert Orth, of Berlin. In psychology, Principal C. Lloyd Morgan, of Bristol; M. Pierre Janet, of Paris; Professors Herm. Ebbinghaus, of Breslau; and Carl Stumpf, of Berlin. In philosophy, Professors Henri Bergson, of Paris; Carl Dessoir, of Berlin; Alois Riehl, of Halle; Windelband, of Strasburg; and W. R. Sorley, of Cambridge, England.

The vacancy on the board of trustees of the Elizabeth Thompson Science Fund, caused by the resignation of Dr. J. M. Crafts, has been filled by the election of Professor T. W. Richards, of Harvard University.

Mr. R. Lydekker, F.R.S., has been elected a foreign member of the R. Accademia dei Lincei, Rome.

Professor Guido Baccelli has been elected a corresponding member of the Paris Academy of Medicine, in the Section of Medicine and Surgery. Dr. Baccelli is the Italian minister of agriculture.

Dr. Julius Wiesner, professor of botany at the University of Vienna, has been elected a corresponding member of the Academy of Sciences at Turin.

G. L. Swendsen, professor of civil engineering and hydraulic engineer to the Utah Agricultural College and Experiment Station, has resigned to accept an appointment with the U. S. Geological Survey.

Professor W. O. Atwater, of Wesleyan University, is at present abroad and will remain until November, studying experiments there being made on human nutrition.

Professor Geo. F. Atkinson, who holds the chair of botany at Cornell University, sailed for Europe last week.

Dr. A. Petrunkevitsch, docent for zoology at Freiberg, is about to visit America to carry on scientific work.

Mr. W. C. Welborn, formerly of the Mississippi Agricultural and Mechanical College,

has gone to the Philippines, to accept a position in the Bureau of Agriculture.

Nature states that Mr. W. R. Ogilvie-Grant, of the Natural History Museum, has returned from his trip to the Azores with a large collection of birds, insects and land molluscs, the latter including some forms of special interest.

LIEUTENANT KOLCHAK has started from the Arctic coast for the New Siberian Islands in search of Baron Toll, the head of the Russian polar expedition which left St. Petersburg three years ago.

A MEETING was held in Bar Harbor, Maine, on August 15, to confer with respect to the memorial in honor of the late Major Walter Reed, M.D., U.S.A., to whom the world is indebted for most important services in the investigation and the suppression of yellow fever. The meeting was called by President Daniel C. Gilman, Drs. S. Weir Mitchell, Edward G. Janeway, Wm. H. Welch and Christian A. Herter.

GENERAL E. E. BRYAN, a prominent lawyer of Wisconsin, for several years dean of the Wisconsin University Law School, died on August 11, at the age of sixty-eight years. At the time of his death he was president of the Commission of Fisheries for the State of Wisconsin, and president of the Commission for the Natural History and Geological Survey of the State.

M. PROSPER HENRY, since 1865 connected with the Paris Observatory, well-known for his work in celestial photography carried out in conjunction with his brother, M. Paul Henry, died in the French Alps on July 25, as a result of exposure to the cold.

M. ERNEST MENAULT, inspector general of agriculture in France and the author of numerous works on agriculture and economic entomology, has died at the age of seventy-two years.

DR. BACCIALLI has died as the result of an accidental inoculation while carrying on bacteriological investigations at Bologna.

WE regret also to record the deaths of Dr. Eduard Weyr, professor of mathematics at the Prague Technological Institute, who died on July 23, at the age of fifty years, and of Dr. Apollon Kurbatow, professor of applied chemistry at the St. Petersburg Technological Institute.

ACCORDING to an answer to a question in the House of Commons the sums voted for London museums and galleries for the current year are: Victoria and Albert Museum and Bethnal-green Museum, £66,994; Geological Museum, £3,558; British Museum, £128,729; Natural History Museum, £49,051; National Gallery, £18,600; National Portrait Gallery, £5,541; Wallace Collection, £9,066.

THE British Civil Service supplementary estimates include the sum of £45,000 for the relief expedition to be sent to the Antarctic.

THE daily papers state that the schooner *Marie Sachs,* sent by the California Academy of Sciences to explore the islands of the Pacific coast, has returned with numerous collections, after a voyage of four thousand miles.

ACCORDING to the New York *Evening Post* a scientific expedition, led by an American, Major W. C. Daniels, will leave Southampton on September 1 for New Guinea. Major Daniels will be accompanied by Dr. C. G. Seligman, a member of the Cambridge Anthropological expedition to Torres Strait and Sarawak, Borneo; Dr. William Strong, of Trinity College, Cambridge; and A. H. Dunning. Major Daniels has equipped a schooner, and the Royal Geographical Society has furnished the instruments. The Royal Society and the British government are helping the expedition financially. Ethnological, pathological, geographical and geological investigations will be made.

IT appears from an article in *Nature* that the arrangements for the Southport meeting of the British Association are well advanced. The meeting at Southport in 1883 was one of the most successful in the history of the Association, standing eighth in point of numbers and fourth in point of receipts, with 2,714 members in attendance. It is consequently hoped that the meeting this year will be larger and more interesting than usual. Evening lectures will be given by Dr. Robert Monroe

on 'Man as Artist and Sportsman in the Paleolithic Period,' and by Dr. Arthur Roe on 'The Old Chalk Sea and some of its Teachings,' while the evening lecture to working-men will be given by Dr. J. S. Flett on 'The Recent Volcanic Eruptions in the West Indies.' Americans returning home from summer holidays abroad will find Southport a very convenient place for the meeting, which begins on September 9.

At the meeting of the German Association of Men of Science and Physicians to be held at Cassel from September 20 to 26, general addresses are promised by Professor Ziehen of Utrecht, on the physiological psychology of the feelings and affections; by Dr. Griesbach of Muhlhausen, on the present condition of school hygiene; and by Professor von Behring of Marburg, on the struggle against tuberculosis.

The Congress of Alienists and Neurologists of France and French-speaking Countries held its thirteenth annual meeting at Brussels beginning August 1.

The twenty-fourth annual meeting of French Geographical and Colonial Societies was held this month in Rouen. According to the London *Times* twenty-four French geographical societies were represented, nine kindred societies, and three foreign geographical societies. The Royal Geographical Society was represented by Mr. H. J. Mackinder, director of the School of Geography at Oxford. Various French Ministries were also represented. The program was a long one, including about forty communications, many of them on questions of great importance and wide interest. On the conclusion of the congress a number of excursions were arranged for, about eighty of the members proposing to go to England.

The *British Medical Journal* gives some details in regard to the International Congress for the Study of Tuberculosis which will be held in Paris from September 24 to October 1, 1904. The congress will comprise a medical, a social and a technical section. In the medical section the following are the questions proposed for discussion: (1) The treatment of lupus by the new methods; (2) the early diagnosis of tuberculosis by the new methods; (3) comparative study of the different forms of tuberculosis. The social section will discuss the following questions: (1) The etiological factors of tuberculosis; (2) the value of the various methods of treating tuberculosis; (3) assurance and sickness societies in relation to the struggle against tuberculosis. The technical section consists of a museum in which will be exhibited collections of anatomo-pathological, histological and bacteriological specimens and preparations; tables of statistics, plans and designs for the installation of hospitals, sanatoria and dispensaries; publications of all kinds relative to antituberculosis leagues and associations; and industrial products used in the treatment of tuberculosis. The president of the congress is Professor Brouardel.

A difficult piece of topographic surveying has recently been completed in connection with the Uncompahgre Valley projects in western Colorado. In the course of the investigations it became necessary that a topographic survey should be made of about 1,500 feet of the bottom of the Grand Canyon of the Gunnison River. A general survey of this canyon was made last year by parties connected with the Reclamation Service, and the locality mentioned was selected as the point for the location of the head of a tunnel six miles in length to be constructed for the purpose of conducting water into the Uncompahgre Valley. The canyon at this point is approximately 2,000 feet in depth, the walls being sheer precipices. The water flows very swiftly over huge boulders and through narrow gorges, and it is therefore impossible, particularly at high stages, to use boats or to traverse the canyon longitudinally in any way. In order, therefore, to obtain the topography of this section it was necessary to descend into the canyon over cliffs and through narrow fissures in four different places. The topography of the talus slope for about 600 feet on the south side of the river was taken first by descending through a narrow fissure which, being of softer material than the granite cliffs of which the walls are generally

composed, had in the process of time eroded and made it possible for a party to descend. The party then, by means of a detour of approximately 150 miles, came down a similar fissure on the opposite side of the river and obtained the topography of that side for about an equal distance. About 12,000 feet further upstream they were able to descend again to another short talus slope, although the descent was extremely perilous, it being necessary for the party at times to descend over steep cliffs for several hundred feet by means of ropes. On the opposite side was another small talus slope, which was reached by a similar descent after the return of the party to the south side. There was one other small talus slope, between the extreme tracts already mentioned, which it was impossible for the party to reach with instruments, but one man descended this slope also by means of ropes, in order that he might set signals for triangulation. This dangerous piece of work was at last concluded, however, to the satisfaction of the chief of the party. The Uncompahgre Valley project is under the general direction of Mr. A. L. Fellows, district engineer; the men who made the descents into the canyon were Mr. I. W. McConnell, resident engineer, Mr. W. P. Edwards, assistant engineer, and Messrs. R. H. Sargent and L. E. Foster, topographers.

THE annual Blue-book relating to the British Museum has been published. According to an abstract in the London *Times* the report on the British Museum (Natural History) by Professor Ray Lankester, director, states that the number of visits was 433,619, compared with 417,691 in 1901. The attendance on Sunday afternoons has increased from 57,797 to 61,035. The average daily attendance was 1,197, for week-days only 1,201, and for Sunday afternoons 1,173. The report also states that the survey of the fishes of the Nile, begun in February, 1899, in cooperation with the Egyptian government, came to an end in June last. The work done since the last report was on the Blue Nile and White Nile. The former was explored as far as Rosaires, the latter as far as Gondokoro, where a valuable collection was made. The whole collection made during the three years' operations, amounting to some 9,500 specimens of over 100 species of fishes (14 being new to science), has reached the museum, and the final description of the material obtained is being proceeded with for publication by the Egyptian government. In consequence of the marked success which attended Dr. C. W. Andrews's mission to Egypt in 1901, he was again sent to that country last year, with treasury sanction, for the purpose of continuing the geological explorations in the Fayûm. The season's operations resulted in the acquisition for the museum, partly by excavations and partly by arrangements with the Geological Survey of Egypt, of a very important and valuable series of fossils, including remains of *Arsinoitherium, Palæomastodon,* etc. The collections thus acquired represent nearly all the important forms yet discovered in the locality, besides several species that are almost certainly new to science. The trustees have accepted a generous offer by Mr. W. E. De Winton to defray the expenses of carrying on geological explorations in Egypt for one or two seasons, and to present all the specimens obtained to the museum. Dr. Andrews has accordingly been despatched to Egypt to superintend the excavations in the present season. Mr. W. R. Ogilvie Grant, an assistant in the Zoological Department, has been authorized to proceed to the Azores to make a zoological exploration of that group of islands, with a view to collect specimens, the cost of the expedition being defrayed by Mr. Walter Rothschild, M.P. An arrangement has been made with the committee of the National Antarctic Expedition, under which the British Museum will receive the collections obtained, the trustees having agreed to publish the natural history results of the voyage.

The Experiment Station Record states that the successful work of the local agricultural experiment stations in Japan has made it possible for the ministry of agriculture and commerce to reduce the number of branch experiment stations connected with the Central Agricultural Experiment Station at Nishigahara, and to concentrate its efforts and

funds on a smaller number of stations and fewer lines of work. Until April, 1903, there were nine of these branch stations, but at that time six of them, viz., the Hokuriku, Too, Tokai, Shikoku, Sanio and Sanin branch stations, were turned over to the control of the local government, and the funds and staffs of these institutions were transferred to the Central Agricultural Experiment Station, and the three remaining branch stations, *i. e.*, those at Kashiwabara, Idzumimura and Hanadatemura. The funds available for the Central Station and its three branches for the fiscal year ending March 31, 1904, amount to $91,920. The total budget of the ministry of agriculture and commerce for the year is $3,386,713. The local stations referred to above now number thirty-nine. They receive subsidies from the ministry of agriculture and commerce amounting to $65,000 a year and also funds appropriated by the local governments. The annual expenditures of these stations vary from $2,200 to $11,232. In addition to the stations supported by public funds, there are three private experiment stations. The island of Formosa supports three agricultural experiment stations and a tea experiment station, all of which are under the control of the Bureau of Industries of Formosa.

UNIVERSITY AND EDUCATIONAL NEWS.

Mr. Joseph Pulitzer, the proprietor of the New York *World*, has given $1,000,000 to Columbia University to establish a school of journalism, and will add a second million when the school is in successful operation at the end of three years. President Butler announces that the school will take rank with the existing professional schools of law, medicine, engineering, architecture and education, and that a building will be erected at once at a cost of about $500,000.

The Experiment Station Record states that the total appropriation for the Pennsylvania State College made by the state legislature at its recent session was $250,805.55. Of this amount $100,000 is for the purpose of assisting in the erection, equipment and furnishing of a building for the department of agriculture of the college, while $150,000 additional is virtually pledged by the attachment of a proviso requiring the trustees of the college to file with the auditor-general plans, specifications and estimates satisfactory to him showing that the entire cost of the building and equipment will not exceed $250,000.

By the will of Mary P. Eakin, of New London, Yale University receives one third of her estate, about $5,000. It is given without restrictions as a memorial to her late son, W. S. Eakin, of the class of 1892.

Dr. Waldemar Koch, Ph.D. (Harvard, 1900), has been elected assistant professor of physiological chemistry and pharmacology in the University of Missouri. Dr. Koch is spending the summer at Strasburg and will spend the autumn months in England. He assumes his duties in the University of Missouri on January 1.

Dr. J. R. Murlin has resigned from Ursinus College to become instructor in physiology at University and Bellevue Hospital Medical College.

Professor Charles K. Francis, who has been junior professor of chemistry in the Georgia School of Technology for some time, has resigned to accept the chair of chemistry in Converse College, Spartanburg, S. C.

Mr. Howard Marsh, surgeon to St. Bartholomew's Hospital, London, and formerly professor of pathology and surgery at the Royal College of Surgeons of England, has been elected to the professorship of surgery at Cambridge University, which has been vacant since the death of Sir G. M. Humphry, F.R.S.

M. Andoyer has been appointed professor of physical astronomy and M. Painlevé professor of mathematics at the University of Paris.

M. Padé has been made professor of mechanics at Bordeaux and M. Lebœuf, professor of astronomy at Besancon.

Dr. Arthur Korn has been elected associate professor of theoretical physics and Dr. von Weber associate professor of mathematics at the University of Munich.